**Before the**
**Federal Communications Commission**
**Washington, D.C. 20554**

In the Matter of

| | | |
|---|---|---|
| Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services | ) | WT Docket No. 02-381 |
| 2000 Biennial Regulatory Review Spectrum Aggregation Limits For Commercial Mobile Radio Services | ) | WT Docket No. 01-14 |
| Increasing Flexibility To Promote Access to and the Efficient and Intensive Use of Spectrum and the Widespread Deployment of Wireless Services, and To Facilitate Capital Formation | ) | WT Docket No. 03-202 |

# COMMENTS OF UTSTARCOM, INC.


Danny E. Adams
Joan M. Griffin
KELLEY DRYE & WARREN LLP
8000 Towers Crescent Drive
Suite 1200
Vienna, VA 22182
(703) 918-2300

M. Nicole Oden
KELLEY DRYE & WARREN LLP
1200 19th Street, N.W.
Suite 500
Washington, D.C. 20036
(202) 955-9600


Dated: December 29, 2003

## TABLE OF CONTENTS

## Summary

UTStarcom, Inc. ("UTStarcom" or the "Company") is a U.S. corporation that provides wireless communications infrastructure that enables carriers to provide limited mobility and fixed wireless services that are low in cost, easily managed on a local basis, and reliable in rural and underserved areas. This equipment, which operates in the 1880-1920 MHz band, has been extensively deployed in mainland China and many developing countries. UTStarcom's equipment enables carriers to provide an economically viable service, including limited mobility and Internet access, at an average revenue per user below $10 per month.

UTStarcom supports the Commission's goal in this proceeding of ensuring that wireless services are ubiquitous for all Americans, and suggests adoption of the following rules and policies to advance this objective.

As a starting point, UTStarcom recommends that the Commission apply the rules and policies adopted in this proceeding in all areas where wireless services that are affordable to low-income Americans are not available, as well as in rural areas. While making wireless services ubiquitous is an important goal, ubiquity is meaningless for those Americans who cannot afford to purchase wireless services as currently provided by the national wireless carriers. Americans should not be denied access to affordable wireless services simply because they live in urban areas.

The Commission can immediately facilitate the provision of low-cost wireless services in rural and underserved areas by modifying its technical rules applicable to the 1910-1920 MHz band in accordance with UTStarcom's Petition for Rulemaking regarding this spectrum (RM 10024, filed November 6, 2000). These rule changes would permit the use of UTStarcom's currently available equipment in this underused frequency band. Auctioning off the 1910-1920

MHz band to wireless service providers or using the spectrum as a new home for licensees that are voluntarily or involuntarily displaced from other bands, as other carriers have proposed, will not promote achievement of the Commission's goals in this proceeding.

Ready and reasonably priced access to spectrum is essential to the provision of low cost wireless services in rural and underserved areas. To ensure that such spectrum is available, UTStarcom supports the Commission's proposal of extending the "substantial service" construction benchmark, or other flexible construction requirement, to additional services. However, in return for this greater flexibility, licensees must be required to lease out any unused spectrum. These leases should be *de facto* transfer leases for the duration of the license and any renewal period, and must be based on reasonable and non-discriminatory terms and conditions. Failure to lease unused spectrum should be grounds for revoking the license. For services that already have a "substantial service" option, the Commission should create incentives (*e.g.*, discounts on regulatory fees, or bidding credits in future spectrum auctions) for licensees to lease out their unused spectrum.

UTStarcom recommends that the Commission adopt smaller geographic area licenses, such as single county size, to ensure that reasonably priced spectrum is available to smaller carriers. The Commission should refrain from granting additional nationwide licenses, since nationwide licensees can easily avoid serving rural and underserved areas.

Finally, UTStarcom supports any proposed change in the regulatory scheme that will enable licensees to obtain funding. However, it would be more prudent to encourage carriers to deploy small wireless systems at the start and then grow them as business develops, since this business strategy does not require high levels of capital expense.

**Before the**
**Federal Communications Commission**
**Washington, D.C. 20554**

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | |
| Facilitating the Provision of Spectrum-Based Services | ) | |
| to Rural Areas and Promoting Opportunities for | ) | WT Docket No. 02-381 |
| Rural Telephone Companies To Provide | ) | |
| Spectrum-Based Services | ) | |
| | ) | |
| 2000 Biennial Regulatory Review | ) | WT Docket No. 01-14 |
| Spectrum Aggregation Limits For Commercial Mobile | ) | |
| Radio Services | ) | |
| | ) | |
| Increasing Flexibility To Promote Access to and the | ) | |
| Efficient and Intensive Use of Spectrum and the | ) | WT Docket No. 03-202 |
| Widespread Deployment of Wireless Services, and | ) | |
| To Facilitate Capital Formation | ) | |

## COMMENTS OF UTSTARCOM, INC.

As a provider of low cost community wireless network infrastructure specifically designed to provide cost effective and reliable voice and data services to rural and underserved communities, UTStarcom, Inc. ("UTStarcom" or "the Company") possesses experience and perspective that is unique, and perhaps invaluable, to the proceeding before the Federal Communications Commission ("FCC" or "Commission") in this docket.[1] UTStarcom believes that the Commission's goal of providing affordable ubiquitous wireless communication services to rural and underserved communities in the United States, including tribal lands, is an important and readily obtainable objective, and that the Commission has already made substantial progress

[1] In the Matter of Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services; 2000 Biennial Regulatory Review Spectrum Aggregation Limits For Commercial Mobile Radio Services; Increasing Flexibility to Promote Access to and the Efficient and Intensive Use of Spectrum and the Widespread Deployment of Wireless Services, and To Facilitate Capital Formation, *Notice of Proposed Rulemaking*, FCC 03-222 (*rel.* October 6, 2003) ("*NPRM*").

toward achieving this goal. UTStarcom believes that adoption of certain rules and policies will advance the Commission's objective and help ensure increased deployment of service to rural and underserved communities. As discussed below, UTStarcom contends that the Commission should (1) mandate greater access and more efficient use of available spectrum; (2) create smaller, flexible geographic area licenses; and (3) promote additional financial assistance for carriers that deploy and provide service to rural and underserved populations. In addition, the Commission should modify the FCC's technical rules applicable to the 1910-1920 MHz spectrum in accordance with UTStarcom's Petition for Rulemaking regarding this frequency band.[2]

In order to contribute to the Commission's evaluation of the issues raised in this proceeding, and in hopes of moving the process forward through sound recommendations designed to assist the Commission in realizing its goal of affordable ubiquitous rural service, UTStarcom hereby submits these comments in response to the Commission's October 6, 2003, *Notice of Proposed Rulemaking* ("*NPRM*") issued in the above referenced docket.

## I. BACKGROUND

UTStarcom is a U.S. corporation based in Alameda, California, that provides wireless communication infrastructure to service providers around the globe. UTStarcom's equipment enables carriers to provide limited mobility and fixed wireless services that are low in cost, easily managed on a local basis, and reliable in rural and underserved areas. This "community wireless network" infrastructure has been tested and proven sound through extensive and successful deployment in many developing countries and mainland China.

---

[2] *See* UTStarcom, Inc., Petition for Rulemaking, RM-10024, Nov. 6, 2000 ("Petition for Rulemaking").

One of the more popular products provided by UTStarcom is its Personal Access System ("PAS"), a wireless local loop/limited mobility system based on the Japan standard RCR-28 Personal Handyphone ("PHS") air interface. More than 50 carriers in China use this type of network, primarily in smaller markets. The system is also used by carriers in Haiti, Vietnam, Mali, Nigeria, and elsewhere in areas where the population cannot afford to pay a great deal for telephone service. PAS allows rural telephone companies to provide service to their communities simply and inexpensively, by using the carrier's existing switching, copper wire, and billing systems, as well as existing staff. Using PAS, operators can provide an economically viable service at an average revenue per user below $10 per month. This compares to the U.S. wireless average of over $40 per month, and the U.S. wireline average of over $20 per month.[3] PAS equipment operates at low power, thus easily avoiding interference with higher power systems in adjacent bands and enabling minimally trained operators to perform installation and maintenance. In addition, PAS operates on a small amount of bandwidth – 5 MHz to 10 MHz – to support a relatively large number of users through small cells and high frequency reuse. PAS automatically supports several FCC mandated functions such as TTY over digital wireless, E911 location identification, wired-to-wireless number portability, and number pooling, and can support new functions such as simultaneously ringing wired and local mobile phones.

UTStarcom's community wireless network infrastructure can provide mobility on a limited basis at a cost to consumers that is typically comparable to wireline service. PAS can provide very acceptable Internet access in places that would otherwise continue to wait for service of any kind. Because of the reasonable cost associated with this technology's

---

[3] *See In the Matter of Implementation of Section 60002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services,* Fifth Report, 15 FCC Rcd. 17660 (rel. Aug. 18, 2000); FCC Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service, Industry Analysis and Technology Division, rel. July 15, 2003.

deployment and service, implementation is a realistic possibility even in rural areas where cost has generally been deemed exorbitant.

In the course of providing limited mobility and fixed wireless systems to carriers in the U.S. and abroad, UTStarcom has witnessed the opportunities made available through the use of these networks - providing individuals living in rural and underserved communities with their first, and often only available, telecommunications and Internet service. Unfortunately, the promise associated with this equipment has not yet been fully realized in the United States. While many carriers who serve or want to serve rural and underserved areas have expressed interest in deploying UTStarcom's infrastructure, they have had great difficulty in obtaining the necessary spectrum to do so. As currently designed, PAS operates between 1880-1920 MHz. These frequencies have been set aside for voice and data applications in many other countries, and thus UTStarcom has designed its equipment to operate in this band. While the 1910-1920 MHz band has been set aside in the U.S. for unlicensed operations (specifically, for the use of asynchronous data UPCS devices), PAS cannot operate in accordance with the technical rules applicable to this spectrum. As mentioned previously, UTStarcom has petitioned the Commission to modify the technical rules applicable to the 1910-1920 MHz band to enable use of PAS, but the Commission has not yet adopted the requested rule changes. In the U.S., the 1880-1910 MHz band covers portions of the spectrum previously allocated for PCS services (C-, F-, E-, and part of B-block). Per UTStarcom's customers, PCS licensees have for the most part been unwilling to share the unused portions of their licensed spectrum, unless the lessee becomes a franchisee or affiliate of the licensee.

Community wireless networks such as PAS are capable of making the Commission's goal of affordable ubiquitous wireless service a reality. Adoption of the rules and policies

discussed below will facilitate wider deployment of this equipment and thus will ensure that all Americans have access to reasonably priced wireless services.

## II. DISCUSSION

The measures proposed by the Commission in the *NPRM*, designed to promote deployment of wireless services to rural and underserved communities, are a definite step in the right direction, and the Company supports many of the proposals set forth therein. However, UTStarcom respectfully suggests that the Commission can do even more to ensure the availability of low cost, widespread, reliable communication service to rural and underserved areas within the United States. In an effort to assist the Commission in its evaluation of the means through which it can achieve its goals, UTStarcom submits the following comments.

### A. The Rules And Policies Adopted By The Commission In This Proceeding Should Apply To All Underserved Communities, Not Just Areas Of Low Population Density.

The Commission's objective in the instant proceeding is to ensure that wireless services are ubiquitous for all Americans, by encouraging and promoting the rapid deployment of new technologies, services, and products for the benefit of those Americans living in areas where such services are not readily available.[4] In accordance with this goal, and the Commission's efforts to establish policies that will advance it, the Commission has sought comment on various definitions of "rural area."[5] Areas of low population density, however, are not the only communities lacking affordable access to wireless communication services.

UTStarcom urges the FCC to acknowledge the needs of all underserved communities in the United States and make the rules and policies adopted in this proceeding applicable in all

---

4 *NPRM* at ¶ 2.

5 *NPRM* at ¶ 10.

areas where wireless services that are affordable to low-income Americans are not available. The rules and policies that the Commission adopts in this proceeding may make wireless services ubiquitous, but ubiquity is irrelevant for people of lesser means who cannot afford to purchase wireless services as currently provided by the national wireless carriers.[6] Americans should not be denied access to affordable wireless services simply because they reside in urban areas, particularly when the means to make affordable wireless services available in urban areas is readily at hand. If the Commission applies the rules and policies adopted in this proceeding in those communities that are financially but perhaps not geographically isolated, as well as in rural areas, carriers will be better able to deploy infrastructure and provide service as needed to these underserved communities, without laboring under arbitrary and limiting definitions that may only serve to continue the marginalization of certain populations. Thus, applying the rules and policies adopted in this proceeding to both rural and underserved areas would best promote the FCC's goal of affordable ubiquitous service – engendering important adaptability to the different needs and requirements of different communities.

## B. The Commission Should Modify The Technical Rules For The 1910-1920 MHz Band In Accordance With The Prior Recommendations Of UTStarcom.

In the *NPRM,* the Commission advocates certain modifications to its Part 15 rules to promote and enhance the provision of wireless services in rural and underserved areas.[7] The

---

6 Even if the Commission decides to apply the rules and policies adopted in this proceeding on areas of low population density, focusing on the availability of reasonably priced services is important, because per capita and family income of people in rural areas tends to be lower than per capita and family income of people in urban or suburban areas. *See* Economic Resource Service (United States Department of Agriculture), *"The Economics of Food, Farming, Natural Resources, and Rural America: Rural Income, Poverty and Welfare: Rural Income"*(2003), available at http://www.ers.usda.gov/Briefing/IncomePovertyWelfare/RuralIncome/ (for 2001, rural median family income was $41,012, while urban median family income was $54,657; per capita income in metro areas ($32,077) far exceeded per capita income in nonmetro areas ($21,077)).

7 *NPRM* at ¶¶ 48-50.

Commission can immediately facilitate the provision of low-cost wireless services in rural and underserved areas by adopting the Part 15 rule changes proposed by UTStarcom in its Petition for Rulemaking. At a minimum, the Commission should immediately grant all pending requests for Part 15 rule waivers to enable use of PAS.[8]

A copy of the rule changes proposed by UTStarcom is provided in Attachment 1. The rule changes proposed would permit the use of isochronous UPCS devices that support voice and data services, such as PAS, in the 1910-1920 MHz band, without interference to isochronous UPCS operations in the 1920-1930 MHz band. UTStarcom proposes use of the "coordinated unlicensed" approach currently employed by UTAM for the UPCS spectrum between 1920-1930 MHz to manage the operations of equipment in this band so as to minimize in-band interference. As discussed previously, this equipment is proven technology that is spectrally efficient, inexpensive relative to other wireless systems, and easy to install, operate and maintain. As evidenced by the licenses granted by the FCC to deploy this equipment on an experimental basis[9] and the pending waiver requests, there is considerable interest in using community wireless infrastructure to provide wireless services in rural and underserved areas.

UTStarcom submits that the Commission will not achieve its goal of ensuring the availability of low-cost wireless services in rural and underserved areas by auctioning off the 1910-1920 MHz band to wireless service providers to compete in already competitive urban

---

8 *See, e.g.,* Request Of UTStarcom And Drew University For Waiver Of Sections 15.307; 15.311; 15319(a), (c), (e); And 15.321 Of The Commission's Rules, DA 00-2061, Sept. 8, 2000; Request Of Alaska Power & Telephone Company, Inc., For Waiver Of Sections 15.319 And 15.321 Of The Commission's Rules, DA 01-2308, Oct. 5, 2001.

9 *See* Application of China Quantum Communications, Inc., For Experimental License in File Nos. 0234-EX-PL-2002, 0235-EX-PL-2002, and 0236-EX-PL-2002 (granted Oct. 23, 2002); Application of Stellar Holdings, LLC For Experimental License in File No. 0038-EX-PL-2003 (granted May 5, 2003); Application of Qwest Communications For Experimental License in File No. 0233-EX-PL-2003 (granted Nov. 3, 2003); Application of UTStarcom, Inc. For Experimental License in File No. 0072-EX-ML-2000 (granted Dec. 8, 2000).

markets, or by using the spectrum as a new home for licensees that are voluntarily or involuntarily displaced from other bands, as other carriers have proposed in other proceedings.[10] The Commission should disregard any plan for the 1910-1920 MHz spectrum that creates additional PCS licenses or utilizes the spectrum for relocation purposes. In the event the Commission continues to study the potential for other uses of the 1910-1915 MHz band,[11] then the Commission should immediately implement UTStarcom's proposed rule changes in the 1915-1920 MHz band while those studies continue. Such action would enable the rapid deployment of community wireless infrastructure in rural and underserved areas to the ultimate benefit of the public.

### C. To Improve Access To Unused Spectrum, The Commission Should Extend The "Substantial Service" Construction Benchmark To Other Wireless Services, But Should Also Require Or Incentivize Licensees To Lease The Unused Portions Of Their Licenses or Spectrum.

Ready and reasonably priced access to spectrum is essential to the provision of low cost wireless services to rural and underserved communities. Although the Commission has gone to great lengths to promote efficient utilization and access to spectrum, additional measures are required. In the course of providing community wireless systems to carriers, UTStarcom has witnessed the difficulty most providers face in trying to obtain spectrum. Most of the larger

---

[10] *See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258,* Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order, FCC 03-16, rel. Feb. 10, 2003, at ¶ 45 (discussing proposal of Nextel to swap 1910-1915 MHz and other frequencies for frequencies in 800 MHz band to resolve public safety and CMRS interference issues, and proposal of the Wireless Communications Association to relocate MDS Channels 1 and 2/2A to 1910-1916 MHz and other frequency bands). The controversy surrounding these proposals strongly suggests that any decision by the Commission to adopt one of these proposals in some form will be mired in litigation for many years to come, during which period the 1910-1920 MHz band will remain unused.

[11] *See Id.* at ¶¶ 46-55.

carriers, despite their unwillingness to provide affordable service in rural and underserved areas, will not relinquish spectrum easily -- or even reasonably. The larger carriers either flatly refuse to partition or lease portions of their spectrum, demand exorbitant compensation, or require other unreasonable terms, none of which serves the public good. The end result is that spectrum goes unused or underused, and the carriers that are willing to serve rural and underserved communities either have no spectrum or cannot provide an economically viable service using the spectrum that they have been able to obtain.

The Commission proposes in the *NPRM* to extend use of the "substantial service" benchmark for construction to additional wireless services licensed on a geographic area basis as one way of promoting the availability of low cost wireless services in rural and underserved areas. The Commission states that licensees without a "substantial service" option may be "unduly constrained" and lack sufficient flexibility to provide service to rural areas.[12] UTStarcom support extension of the "substantial service" benchmark, or other flexible construction requirement, to additional services. However, UTStarcom cannot agree with the Commission that such action will by itself encourage and enable licensees to provide service to rural and underserved areas. Despite the base of support for the substantial service standard, a substantial service policy is actually counterproductive to the achievement of the Commission's objectives in this proceeding. As other commenters in this proceeding have recognized, a substantial service requirement makes it significantly easier for larger carriers to avoid deploying and providing service to rural and underserved areas, particularly if the licensed geographic area is sizeable.[13] Carriers are able to meet their "substantial service" obligations by focusing solely on urban areas and travel routes, leaving rural and underserved populations with a continuing

---

12 *NPRM* at ¶ 35.

13 *See, e.g.,* Comments of OPASTCO, filed Feb. 3, 2003, at 12-13.

dearth of options.

If the Commission is going to give licensees additional flexibility in meeting their construction requirements, then there should be a *quid pro quo* to ensure that the Commission's objective of affordable ubiquitous wireless services in rural and underserved areas is advanced. To address this issue, if the Commission extends the "substantial service" construction benchmark to licensees in a service that does not currently have this option (*e.g.*, C-Block licensees with construction deadlines in June 2004), the Commission should at the same time require any licensee that elects this option to lease any unused portions of its spectrum or license to other carriers. For example, if a licensee has satisfied its "substantial service" benchmark by serving major travel routes, leaving other geographic areas within the scope of the license unserved, the licensee should be required to lease spectrum to a carrier that will serve those other areas. For services that currently have the "substantial service" construction benchmark (*e.g.*, E- and F-Block), UTStarcom recommends that the Commission create incentives to encourage these licensees to lease their unused spectrum. For example, licensees who lease spectrum could be given a significant discount on their annual regulatory fees, or a bidding credit useable in a future spectrum auction.

Carriers that lease spectrum under these circumstances will need assurance that they will have extended access to their spectrum and will be able to continue to use the equipment they have deployed for the entire lease period. To that end, UTStarcom believes these leases should be *de facto* transfer leases[14] for the duration of the license and any renewal period, and must be based on reasonable and nondiscriminatory terms and conditions. The lease must not require the lessee to become a franchisee or affiliate of the licensee or otherwise employ equipment or

[14] *See Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, WT Docket No. 00-230,* Report and Order and Further Notice of Proposed Rulemaking, FCC 03-113, rel. Oct. 6, 2003, at ¶¶ 126-159.

provide services dictated by the licensee. For a licensee in a service where leasing is required, failure to lease unused portions of a licensee's spectrum or license (or failure to do so in the manner specified) should be grounds for revoking the license. For a licensee in a service where leasing earns the licensee an incentive, revocation of the lease or failure to lease the spectrum in the manner specified should be grounds for forfeiture of the incentive, plus possible "unjust enrichment" payment.[15]

Finally, UTStarcom supports the Commission's proposal to require additional performance requirements during a license renewal term.[16] Carriers should be able to satisfy these requirements by leasing out spectrum to other carriers. Compelling additional build-out will promote the expansion of service offerings in rural and underserved communities. Through additional service requirements, the Commission garners yet another tool with which to encourage and promote deployment to rural and underserved communities. For these reasons, UTStarcom supports the Commission's proposal for additional service requirements in conjunction with, and as a condition of, license renewal.

### D. In General, The FCC Should Adopt Smaller Geographic Area Licenses To Promote Service In Rural And Underserved Areas, But Should Remain Flexible In Determining Appropriate Service Areas.

The Commission clearly understands, as it states, that the choice of "geographic service areas plays an important role in promoting a number of policy goals including...advancing service to rural areas."[17] UTStarcom agrees completely with the Commission in this regard. Accordingly, UTStarcom urges the Commission to employ geographic areas that are smaller than previously employed – for example, single county size -- so that those carriers willing to

---

15 *See, e.g.*, 47 CFR 1.2111(b).

16 *NPRM* at ¶ 44.

17 *NPRM* at ¶ 63.

provision low cost, reliable wireless communication services to rural and underserved communities may more easily gain access to the spectrum necessary to do so. At the same time, because not all rural and underserved communities are the same, or have the same service needs, the FCC should retain flexibility in determining the appropriate geographic areas for each license. As other parties in this proceeding have recognized, smaller is better in encouraging and facilitating deployment to rural and underserved areas, but one size does not necessarily fit all.[18]

UTStarcom urges the Commission to turn away from its propensity for adopting large nationwide geographic area licenses. The fact that a number of analysts forecast consolidation in the wireless industry strongly suggests that the need for additional nationwide licenses is questionable.[19] The nationwide license, though popular, is not the only valid means of deploying wireless services in the United States. Overall national roaming at the same price charged by the national carriers is not the only business plan that works. UTStarcom believes that most fixed line subscribers use cordless phones and would accept limited mobility at an attractive price. While it is true that small license areas are inefficient for nationwide service, it is not necessarily true if the spectrum is used to provide different types of services.

Furthermore, use of nationwide licenses has actually proven counterproductive in the Commission's efforts to secure ubiquitous, affordable wireless service for rural and underserved communities. By utilizing a nationwide license, larger carriers are able to market a highly profitable national "go anywhere" service. But as noted previously, in actuality the large carriers cherry-pick their service areas, and the "go anywhere" service only covers high density urban

---

[18] *See generally* Comments of the Rural Spectrum Alliance, filed Feb. 3, 2003, at 2; Comments of OPASTCO, filed Feb. 3, 2003, at 8-10; Comments of the South Dakota Telecommunications Association, Filed Feb. 19, 2003, at 1-2.

[19] *See, e.g.,* Lowenstein, Mark, "What to Look for in 2004," WIRELESS WEEK, Dec. 15, 2003; Berniker, Mark, "AT&T Wireless to Target Cingular?", INTERNETNEWS.COM, May 29, 2003, http:/www.internetnews.com/wireless/article.php/2214061, last visited Dec. 29, 2003.

areas and travel routes. The nationwide license holders have not found deployment to rural and underserved areas to be a financially lucrative endeavor, and thus these rural and underserved populations remain without the level of service that much of the country takes for granted.

Because of the focus on large geographic area licenses, smaller carriers that are willing and able to provide service to rural and underserved communities are left without affordable access to the spectrum necessary to do so. And even many of the "smaller" geographic license areas put forth by the FCC may be financially out of reach for certain small carriers. For example, if a carrier does not wish – or is unable -- to serve the named city in a BTA, the carrier may find the cost of the license prohibitive.

By adopting small geographic area licenses, perhaps the size of a single county, and maintaining the flexibility to determine on a state-by-state or community-by-community basis what geographic area provides the highest and best use of the spectrum, UTStarcom believes that the FCC will be in the best position to achieve its objective of ubiquitous, affordable wireless service for all Americans. While there will always be a clamoring for more nationwide licenses, in an already competitive field where ample choice for services and carriers exists, the Commission should take this opportunity to focus on the needs of communities that currently have limited if any choices for wireless service and recognize that this proceeding offers a significant opportunity to correct this imbalance.

### E. While The Commission Should Help Providers of Rural Service Obtain Financial Assistance For Rural Services, The Commission Should Encourage Carriers To Deploy And Grow Small Systems That Do Not Require High Levels Of Funding.

In the *NPRM*, the Commission seeks comment on ways to facilitate increased access to capital in order to fund the deployment and provisioning of service in rural and underserved

communities.[20] UTStarcom encourages the Commission's endeavors in this regard. The Company supports any proposed change in the regulatory scheme (*e.g.*, allowing licenses to be pledged as collateral) that will assist licensees in obtaining funds from the U.S. Department of Agriculture's RUS program or from other sources that will serve to subsidize or lessen the financial burden of providing services to rural and underserved areas.

At the same time, however, UTStarcom believes it would be more prudent for the Commission to encourage carriers planning to provide services to rural and underserved areas to deploy small wireless systems at the start and then grow them as the business develops. Encouraging the deployment of systems that do not require high levels of capital expense will do more to encourage the provision of wireless services in rural and underserved areas than efforts to make more capital available, since any funds borrowed will ultimately need to be repaid. The capital expense associated with the deployment of a wireless system includes not only the expenses associated with the equipment and the license, but also any charges or costs (pro rata or otherwise) for clearing the spectrum of incumbent users. UTStarcom notes that while the spectrum clearing charge for manufacturers of unlicensed PCS devices is $20 per radio, the spectrum clearing charges for PCS licensees can exceed the value of the spectrum, even if the licensee deploys a system that would not technically interfere with microwave links in its BTA. As such, UTStarcom observes that modifying the technical rules for the 1910-1920 MHz band (as proposed in the Petition for Rulemaking and discussed above) to allow the use of PAS and other community wireless systems would drastically reduce the capital requirement for small carriers to offer wireless services, and would reap large dividends for the rural and underserved communities the Commission is committed to assist.

---

[20] *NPRM* at ¶ 72.

## III. CONCLUSION

In conclusion, UTStarcom urges the Commission to take decisive action towards implementation of rules and policies that fully support and encourage affordable ubiquitous wireless deployment and service to rural and underserved communities by adopting the recommendations proposed by UTStarcom in these Comments.

Respectfully submitted,

**UTSTARCOM, INC.**

By: _____

Danny E. Adams
Joan M. Griffin
KELLEY DRYE & WARREN LLP
8000 Towers Crescent Drive
Suite 1200
Vienna, VA 22182
(703) 918-2300

M. Nicole Oden
KELLEY DRYE & WARREN LLP
1200-19th Street, N.W.
Suite 500
Washington, D.C. 20036
(202) 955-9600

Its Attorneys

Dated: December 29, 2003

Attachment 1

## REVISED AND RESTATED PART 15, SUBPART D

### Subpart D – Unlicensed Personal Communications Services Devices

*§ 15.301 Scope.*– This subpart sets out the regulations for unlicensed personal communications services (PCS) devices operating in the 1910-1930 MHz and 2390-2400 MHz frequency bands.

*§ 15.303 Definitions.*

(a) *Asynchronous devices.* Devices that transmit RF energy at irregular time intervals, as typified by local area network data systems.

(b) *Available Band.* A band (1910-1920 MHz or 1920-1930 MHz) is available to a coordinatable UPCS device in a particular location if that location has been coordinated by UTAM, Inc. for that band, and if the device is designed to use that band.

(c) *Cooperating Devices:* A group of two or more devices among which there is RF communication that is coordinated either by a central control entity or by a distributed protocol. An example of a group of cooperating devices is a base station or access point and the portable units communicating with it.

(d) *Control Channel:* A channel that broadcasts system information and carries control information necessary for call connection (including paging information).

(e) *Controlling Device:* A component of a system that selects transmission channels and sends instructions on frequency and time election to a controlled device over a control channel. An example of a Controlling Device is a fixed base station that provides instructions to a portable unit.

(f) *Controlled Device:* A component of a system that transmits based on instructions received from a Controlling Device over a Control Channel. An example of a Controlled Device is a portable unit that takes instructions from fixed infrastructure.

(g) ~~(b)~~ *Coordinatable PCS device.* PCS devices whose geographical area of operation is sufficiently controlled either by necessity of operation with a fixed infrastructure or by disabling mechanisms to allow adequate coordination of their locations relative to incumbent fixed microwave facilities.

(h) ~~(c)~~ *Emission bandwidth.* For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(i) ~~(d)~~ *Isochronous devices*. Devices that transmit at a regular interval, typified by time- division voice systems.

(j) ~~(e)~~ *Noncoordinatable PCS device.* A PCS device that is capable of randomly roaming and operating in geographic areas containing incumbent microwave facilities such that operation of the PCS device will potentially cause harmful interference to the incumbent microwave facilities.

(k) ~~(f)~~ *Peak transmit power*. The ~~peak~~maximum transmit power ~~output as measured~~averaged over ~~a~~na time interval of ~~time equal to~~at most 30/B (where B is the ~~frame rate~~emission bandwidth of the signal), or the transmission burst ~~of the device~~duration, whichever is less, under all conditions of modulation. Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used.

(l) ~~(g)~~ *Personal Communications Services (PCS) Devices [Unlicensed]*. Intentional radiators operating in the frequency bands 1910-1930 MHz and 2390-2400 MHz that provide a wide array of mobile and ancillary fixed communication services to individuals and businesses.

(m) ~~(h)~~ *Spectrum window*. An amount of spectrum equal to the intended emission bandwidth in which operation is desired.

(n) ~~(i)~~ *Sub-band*. For purposes of this subpart the term sub-band refers to the spectrum allocated for isochronous or asynchronous transmission.

(o) ~~(j)~~ *Thermal noise power*. The noise power in watts defined by the formula N=kTB where N is the noise power in watts, ~~k~~K is Boltzmann~~'~~'s constant, T is the absolute temperature in degrees Kelvin (e.g., 295° K) and B is the emission bandwidth of the device in hertz.

(p) ~~(k)~~ *Time window*. An interval of time in which transmission is desired.

***§ 15.305 Equipment authorization requirement.***– PCS devices operating under this subpart shall be certificated by the Commission under the procedures in Subpart J of Part 2 of this Chapter before marketing. The application for certification must contain sufficient information to demonstrate compliance with the requirements of this subpart.

***§ 15.307 Coordination with fixed microwave service.***

(a) UTAM, Inc. is designated to coordinate and manage the transition of the 1910-1930 MHz band from the Private Operational- Fixed Microwave Service (OFS) operating under Part 101 of this chapter to unlicensed PCS operations.

(b) Each application for certification of equipment operating under the provisions of this Subpart must be accompanied by an affidavit from UTAM, Inc. certifying that the applicant is a participating member of UTAM, Inc. In the event a grantee fails to fulfill the obligations

attendant to participation in UTAM, Inc., the Commission may invoke administrative sanctions as necessary to preclude continued marketing and installation of devices covered by the grant of certification, including but not limited to revoking certification.

(c) An application for certification of a PCS device that is deemed by UTAM, Inc. to be noncoordinatable will not be accepted until the Commission announces that a need for coordination no longer exists.

(d) A coordinatable PCS device is required to incorporate means that ensure that it cannot be activated until its location has been coordinated by UTAM, Inc. The application for certification shall contain an explanation of all measures taken to prevent unauthorized operation. This explanation shall include all procedural safeguards, such as the mandatory use of licensed technicians to install the equipment, and a complete description of all technical features controlling activation of the device.

(e) A coordinatable PCS device that is able to operate without a fixed infrastructure shall incorporate an automatic mechanism for disabling operation in the event it is moved outside the geographic area where its operation has been coordinated by UTAM, Inc. The application for certification shall contain a full description of the safeguards against unauthorized relocation and must satisfy the Commission that the safeguards cannot be easily defeated.

(f) At such time as the Commission deems that the need for coordination between unlicensed PCS operations and existing Part 101 Private Operational- Fixed Microwave Services ceases to exist, the disabling mechanism required by paragraph (e) of this section will no longer be required.

(g) Operations under the provisions of this subpart are required to protect systems in the Private Operational-Fixed Microwave Service operating within the 1850-1990 MHz band until the dates and conditions specified in §§ 101.69 through 101.73 of this chapter for termination of primary status. Interference protection is not required for Part 101 stations in this band licensed on a secondary basis.

(h) The operator of a PCS device that is relocated from the coordinated area specified by UTAM, Inc., must cease operating the device until coordination for the new location is verified by UTAM, Inc.

*§ 15.309 Cross reference.*

(a) The provisions of Subpart A of this Part apply to unlicensed PCS devices, except where specific provisions are contained in Subpart D.

(b) The requirements of Subpart D apply only to the radio transmitter contained in the PCS device. Other aspects of the operation of a PCS device may be subject to requirements contained elsewhere in this Chapter. In particular, a PCS device that includes digital circuitry

not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in Subpart B.

*§ 15.311 Labelling requirements.*– In addition to the labelling requirements of § 15.19(a)(3), all devices operating in the frequency band 1910–1930 MHz authorized under this subpart must bear a prominently located label with the following statement:

> Installation of this equipment is subject to notification and coordination with UTAM, Inc. Any relocation of this equipment must be coordinated through, and approved by UTAM. UTAM may be contacted at [insert UTAM's toll-free number].

*§ 15.313 Measurement procedures.*– Measurements must be made in accordance with Subpart A, except where specific procedures are specified in Subpart D. If no guidance is provided, the measurement procedure must be in accordance with good engineering practice.

*§ 15.315 Conducted limits.*– An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in § 15.207.

*§ 15.317 Antenna requirement.*– An unlicensed PCS device must meet the antenna requirement of § 15.203.

*§ 15.319 General technical requirements.*

(a) The 1910-1920 MHz band is limited to use by asynchronous devices under the requirements of § 15.321 and ~~2390-2400 MHz bands are limited to use~~ by ~~asynchronous~~isochronous devices under the requirements of ~~§15.321.~~ 15.320. The 1920-1930 MHz ~~sub-band~~subband is limited to use by isochronous devices under the requirements of § 15.323. The 2390-2400 MHz band is limited to use by asynchronous devices under the requirements of § 15.321.

(b) All transmissions must use only digital modulation techniques.

(c) Peak transmit power.

(1) For devices operating in the 1910-1920 MHz band, peak transmit power for controlled devices shall not exceed 180 microwatts multiplied by the square root of the emission bandwidth in hertz. When a coordinatable PCS device is operating in a county with population not less than 500 per square mile, peak transmit power for controlling devices shall not exceed 250 microwatts multiplied by the square root of the emission bandwidth in hertz. When a coordinatable PCS device is operating in a county with population less than 500 per square mile, peak transmit power for controlling devices shall not exceed 3600 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when

compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

(2) For devices operating in the 1920-1930 MHz band, peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

(d) Power Spectral Density.

(1) For devices operating in the 1910-1920 MHz band in a county with population greater than 500 per square mile, power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

(2) For devices operating in the 1910-1920 MHz band in a county with population less than 500 per square mile, power spectral density shall not exceed 9.5 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

(3) ~~(d) Power~~For devices operating in the 1920-1930 MHz band, power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

(e) The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds ~~3~~6 dBi.

(f) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. ~~These~~The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

(g) Notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in § 15.209 is not required.

(h) Where there is a transition between limits, the tighter limit shall apply at the transition point.

(i) Unlicensed PCS devices are subject to the radiofrequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ""general population/uncontrolled"" environment. Applications for equipment authorization of devices operating under this section must contain a

statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

***§ 15.320 Specific requirements for associated controlling and controlled isochronous devices operating in the 1910-1920 MHz bands.***

(a) Operation shall be contained within the 1910-1920 MHz band for devices that comply with §15.323 (c) through (f) and within the 1910–1918.1 MHz band for other devices. The emission bandwidth of any intentional radiator operating in these bands shall be no more than 1.25 MHz.

(b) All systems shall have their single control channel in the 1910-1912.5 MHz band. It shall be possible to change the control channel used within this band.

(c) The isochronous controlling devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met by controlling and controlled devices:

(1) Not more than 2 s prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

(2) The monitoring threshold must not be more than 39 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria. The 8 hour limitation does not apply to any of the control channels in the 1910-1912.5 MHz band.

(4) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 57 dB above the thermal noise power determined for the emission bandwidth may be accessed. A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 milliseconds frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the previously detected value. The power measurement resolution for this comparison must be accurate to within 6 dB. No device or group of cooperating devices located within 1 meter of each other shall occupy more than three 1.25 MHz channels during any frame period.

(5) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

(6) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than 50xSQRT (1.25/ emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

(7) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

(8) Devices that have a power output lower than the maximum permitted under this subpart may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

(9) An initiating controlling device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device. An initiating controlled device must first communicate over the control channel to a controlling device its desire to establish a duplex connection and wait for instructions from the controlling device.

(10) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a colocated (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or colocated cooperating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

(11) The provisions of (c)(10) or (c)(11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

(d) Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the channel edges and 1.25 MHz above or below the channel; 50 dB between 1.25 and 2.5 MHz above or below the channel; and 60 dB at 2.5 MHz or greater above or below the channel. Systems that further subdivide a 1.25 MHz channel into X subchannels must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the 1.25 MHz channel edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60dB below the transmit power permitted for that radiator. "B" is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(e) The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these subbands shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (timerelated, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

(f) The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ±10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of -20° to +50 °C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

***§ 15.321 Specific requirements for asynchronous devices operating in the 1910-1920 MHz and 2390-2400 MHz bands.***

(a) Operation shall be contained within either or both of the 1910-1920 MHz and 2390-2400 MHz bands. The emission bandwidth of any intentional radiator operating in these bands shall be no less than 500 kHz.

(b) All systems of less than 2.5 MHz emission bandwidth shall start searching for an available spectrum window within 3 MHz of the band edge at 1910, 1920, 2390, or 2400 MHz while systems of more than 2.5 MHz emission bandwidth will first occupy the center half of the band. Devices with an emission bandwidth of less than 1.0 MHz may not occupy the center half of the band if other spectrum is available.

(c) ~~Asynchronous~~ Unless authorized under Section (h) of this paragraph, asynchronous devices must incorporate a mechanism for monitoring the spectrum that its transmission is intended to occupy. The following criteria must be met:

(1) At least once per 24 hour period, the device must monitor the 1910-1912.5 MHz band with a threshold of not more than -81 dBm.

(2) ~~(1) Immediately~~ If activity is detected in the 1910-1912.5 MHz band, then, immediately prior to initiating a transmission, devices must monitor the spectrum window they intend to use for at least 50 microseconds for spectrum windows in the 2390-2400 MHz band, for at least 5 ms for spectrum windows in the 1912.5 – 1920 MHz band and for at least 100 ms for spectrum windows in the 1910 – 1912.5 MHz band. If no activity is detected in the 1910-1912.5 MHz band, then, immediately prior to initiating a transmission, devices must monitor the spectrum window they intend to use for at least 50 microseconds for all spectrum windows.

(3) ~~(2)~~ The monitoring threshold must not be more than 32 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth of the device.

(4) ~~(3)~~ If no signal above the threshold level is detected, a transmission burst may commence in the monitored spectrum window. Once a transmission burst has started, an individual device or a group of cooperating devices is not required to monitor the spectrum window provided the intraburst gap timing requirement specified below is not exceeded.

(5) ~~(4)~~ After completion of a transmission, an individual device or cooperating group of devices must cease transmission and wait a deference time randomly chosen from a uniform random distribution ranging from 50 to 750 microseconds, after which time an attempt to access the band again may be initiated. For each occasion that an access attempt fails after the initial inter-burst interval, the range of the deference time chosen shall double until an upper limit of 12 milliseconds is reached. The deference time remains at the upper limit of 12 milliseconds until an access attempt is successful. The deference time is re-initialized after each successful access attempt.

(6) ~~(5)~~ The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and shall have a maximum reaction time less than 50xSQRT (1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the threshold level, the maximum reaction time shall be 35xSQRT(1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

(7) ~~(6)~~ The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

(8) ~~(7)~~ Devices that have a power output lower than the maximum permitted under the rules may increase their detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

(d) Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the sub-band edges and 1.25 MHz above or below the sub-band; 50 dB between 1.25 and 2.5 MHz above or below the sub-band; and 60 dB at 2.5 MHz or greater above or below the sub-band. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(e) The ~~frequency stability of the carrier frequency of intentional radiators operating in accordance with this section shall be +/- 10 ppm over 10 milliseconds or the interval between channel access monitoring, whichever is shorter. The frequency stability~~emission limits of §15.321(d) shall be maintained over a temperature variation of -20° to +50° Celsius at normal supply voltage, and over a variation in ~~the~~ primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 degrees Celsius. For devices operating under the provisions of (c) above, the monitoring system bandwidth must allow for the effects of temperature and supply voltage variations on the emissions. For equipment that is capable of operating only from a battery, the ~~frequency stability~~emission limit and monitoring bandwidth tests shall be performed using a new battery without any further requirement to vary supply voltage.

(f) An asynchronous transmission burst is a series of transmissions from one or more transmitters acting cooperatively. The transmission burst duration from one device or group of devices acting cooperatively shall be no greater than 10 milliseconds. Any intraburst gap between cooperating devices shall not exceed 25 microseconds.

(g) Operation of devices in the 2390-2400 MHz band from aircraft while airborne is prohibited, in order to protect space research operations at the National Astronomy and Ionospheric Center at Arecibo, Puerto Rico.

(h) As an alternative to Section (c) of this paragraph, devices operating in the 1912.5-1920 MHz band may instead limit their duty cycle such that: (1) the transmit duty cycle of any individual device over any 1-second interval does not exceed 25 percent, unless that device is a member of a group of cooperating devices; and (2) the aggregate transmit duty cycle of any group of cooperating devices over any 1-second interval does not exceed 50 percent.

***§ 15.323 Specific requirements for isochronous devices operating in the 1920-1930 MHz sub-band.***

(a) Operation shall be contained within one of eight 1.25 MHz channels starting with 1920-1921.25 MHz and ending with 1928.75-1930 MHz. Further sub-division of a 1.25 MHz channel is permitted with a reduced power level, as specified in § 15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.

(b) Intentional radiators with an intended emission bandwidth less than 625 kHz shall start searching for an available time and spectrum window within ~~3~~5 MHz of the ~~sub-band~~lower edge ~~at 1920 MHz~~of the lowest available band and search upward from that point. Devices with an intended emission bandwidth greater than 625 kHz shall start searching for an available time and spectrum window within ~~3~~5 MHz of the ~~sub-band~~upper edge ~~at 1930 MHz~~of the highest available band and search downward from that point.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(1) Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 millisecond or shorter frame period or at least 20 milliseconds for systems designed to use a 20 millisecond frame period.

(2) The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

(4) Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signalling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

(5) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed. A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the

previously detected value. The power measurement resolution for this comparison must be accurate to within 6 dB. No device or group of cooperating devices located within 1 meter of each other shall occupy more than ~~three~~six 1.25 MHz channels during any frame period. Devices in an operational state that are utilizing the provision of this section are not required to use the search provisions of paragraph (b) of this section.

(6) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting ~~an~~ amount of time~~,~~ that exceeds 150 milliseconds, or is randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

(7) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than 50xSQRT (1.25/ emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

(8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

(9) Devices that have a power output lower than the maximum permitted under ~~the rules~~this subpart may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

(10) An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

(11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

(12) The provisions of (c)(10) or (c)(11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

(d) Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the channel edges and 1.25 MHz above or below the channel; 50 dB between 1.25 and 2.5 MHz above or below the channel; and 60 dB at 2.5 MHz or greater above or below the channel. Systems that further sub-divide a 1.25 MHz channel into X sub-channels must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the 1.25 MHz channel edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. "'B"' is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(e) The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per ~~millions~~million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

(f) The frequency stability of the carrier frequency of the intentional radiator shall be maintained within +/- 10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of -20° to +50 ° degrees C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 ° C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.